

Air Dispersion Modeling Report

QB Corporation Salmon, Idaho

1. Introduction

QB Corporation is submitting this air dispersion modeling analysis with an application to modify their Permit to Construct number 059-00008 and to demonstrate compliance with National Ambient Air Quality Standards (NAAQS) for criteria pollutants and Acceptable Ambient Concentrations (AAC/AACC) for toxic air pollutants in IDAPA 58.01.01.585 and 586.

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Facility Description:

QB Corporation produces laminated beams, trusses and arches from dimensional lumber. The facility is located approximately 15 miles southwest of Salmon, Idaho on Highway 28. A site plan of the facility is included as Figure 1.

2. Model Description and Justification

BEEST for Windows BEE-Line Software will be used to run the AERMOD Version 07026 air dispersion modeling analysis. This program provides options to model a variety of sources and source types using hourly meteorological data to calculate various short-term averages.

3. Emission and Source Data

The facility employs a wood fired boiler, a 30,000 bpd capacity lumber drying kiln and a target box and ten cyclones to transfer wood waste.

The boiler is used primarily to provide space heat for the facility. About ten percent of the steam heat from the boiler is used in the kiln to finish drying lumber to moist for processing. Two of the cyclones are pull-through cyclones and do not exhaust to atmosphere.

Except for PM and PM-10, emission estimates for the wood fired boiler were calculated using emission factors from AP-42 Section 1.6, Wood Residue Combustion In Boilers.

The boiler PM and, subsequently, PM10 emission rates were calculated from the allowable limit in IDAPA 58.01.01.676. This requires calculating the emission rate based on the exhaust flow at the maximum boiler input capacity. Changing the boiler exhaust to reflect a more typical lower operating rate would also lower the emission rate. Actual exhaust flow was calculated for the stack elevation of 4,592 feet (25.328 in Hg) using 10% exhaust gas moisture and a temperature of 390° F. These reflect the parameters from previous source testing. Modeled emission rates for the boiler are shown in the table below and detailed in the permit application narrative

Wood Fired Boiler Modeled Emission Rates	
Criteria Air Pollutants	Emission Rate (lb/hr)
PM10	2.104
SO2	0.308
NOx	2.706
CO	7.380
VOC	0.209
Lead	5.90E-04
Toxic Air Pollutants	Emission Rate (lb/hr)
Non-Carcogenic	
Acrolein	0.0492
Hydrogen Chloride	0.2337
Silver	0.0209
Carcogenic	
Acetaldehyde	5.28E-03
Arsenic	7.51E-05
Benzene	2.67E-02
Benzo(a)pyrene	1.65E-05
Cadmium	2.61E-05
Carbon Tetrachloride	2.86E-04
Chloroform	1.78E-04
Chromium, Hexavalent	2.23E-05
1,2-Dichloroethane	1.85E-04
Formaldehyde	2.80E-02
Nickel	2.10E-04
Polycyclic Aromatic Hydrocarbons	1.87E-05

Emission rates for the cyclones and the target box were calculated using the process weight (PW) limit in IDAPA 58.01.01.701 based on a potential throughput of 750 lb of wood waste per hour. The table below summarizes emissions from the cyclones and target box.

Wood Waste Transfer Modeled Emission Rates	
Cyclone #	PM10 (lb/hr)
1	0.3330
2	0.3596
3	0.3924
4	0.0135
5	0.0135
6	0.1335
7	0.0003
8	0.0002
Target Box	0.0179
Total	1.2639

The lumber drying kiln has a capacity of 30,000 board feet and is used to finish drying lumber that is too moist for processing. Emission estimates were calculated using a potential throughput of 2 million board feet per year.

Lumber Drying Kilns Modeled Emission Rates	
Criteria Air Pollutants	Emission Rate (lb/hr)
PM	0.0753
PM-10	0.0434
VOC	0.3425
Toxic Air Pollutants	
Non-Carcogenic	
Acrolein	3.219E-04
Carcogenic	
Acetaldehyde	1.863E-02
Formaldehyde	5.452E-04

Exhaust stack parameters for the modeled sources are shown in the table below.

Point Source ID	Easting (m)	Northing (m)	Base Elevation (ft)	Stack Height (ft)	Temperature (°F)	Exit Velocity (m/s)	Stack Diameter (ft)
BLRSTK	289873.7	4989972.4	4592.13	20.00	390.0	10.4863	2.00
CYC1	289880.9	4989947.1	4593.31	59.25	68.0	0.001	5.50
CYC2	289883.0	4989943.7	4593.44	48.67	68.0	0.001	4.25
CYC3	289885.1	4989940.3	4593.57	56.00	68.0	0.001	4.08
CYC4	289869.9	4989950.8	4593.50	60.42	68.0	0.001	3.17
CYC5	289888.1	4989993.7	4590.81	41.00	68.0	0.001	3.33
CYC6	289879.4	4989982.6	4591.60	45.50	68.0	0.001	2.67
CYC7	289880.2	4989979.7	4591.67	41.25	68.0	0.001	1.67
CYC8	289881.7	4989981.7	4591.57	39.58	68.0	0.001	1.33
Volume Source ID	Easting (m)	Northing (m)	Base Elevation (m)	Release Height (m)	Horizontal Dimension (m)	Vertical Dimension (m)	
KILN	289909.2	4989962.4	1399.41	6.71	4.25	3.12	
TBOX	289882.6	4989941.1	1400.15	8.53	0.14	3.97	

The Building Profile Input Program, BPIP-Prime was used to calculate direction-specific building dimensions and GEP stack height information. The building dimensions are shown in the table below.

Building Name	Number of Tiers	Comment	Base Elevation (ft)	Tier Height (ft)	Approx. Lgth × Width (ft)
LBRSHD	1	Lumber Shed	4592.85	22.75	162 × 30
RFBLDG	1	RF Building	4593.73	17.75	153 × 86
GLUE	1		4593.77	28	147 × 87
PRESS	1		4592.16	20.33	117 × 78
FINISH	1		4596.59	33	177 × 60
NPAF	1	New Press and Finish Bldg	4599.05	35.5	303 × 99
SHOP	1		4591.67	25.58	80 × 40
PREGRD	1	Lumber Pregrade	4589.5	32.33	105 × 103
GARG	1	Equipment Garage	4589.93	25.58	39 × 16
BLRHSE	1	Boiler House	4592.19	23.33	40 × 24
DRYKILN	1		4591.31	22	56 × 30
OFFICE	1		4596.26	25	75 × 61
CHIPBIN	1		4593.37	30	42 × 16
TRKBIN	1	Truck Bin	4593.54	35	16 × 16

4. Receptor Network

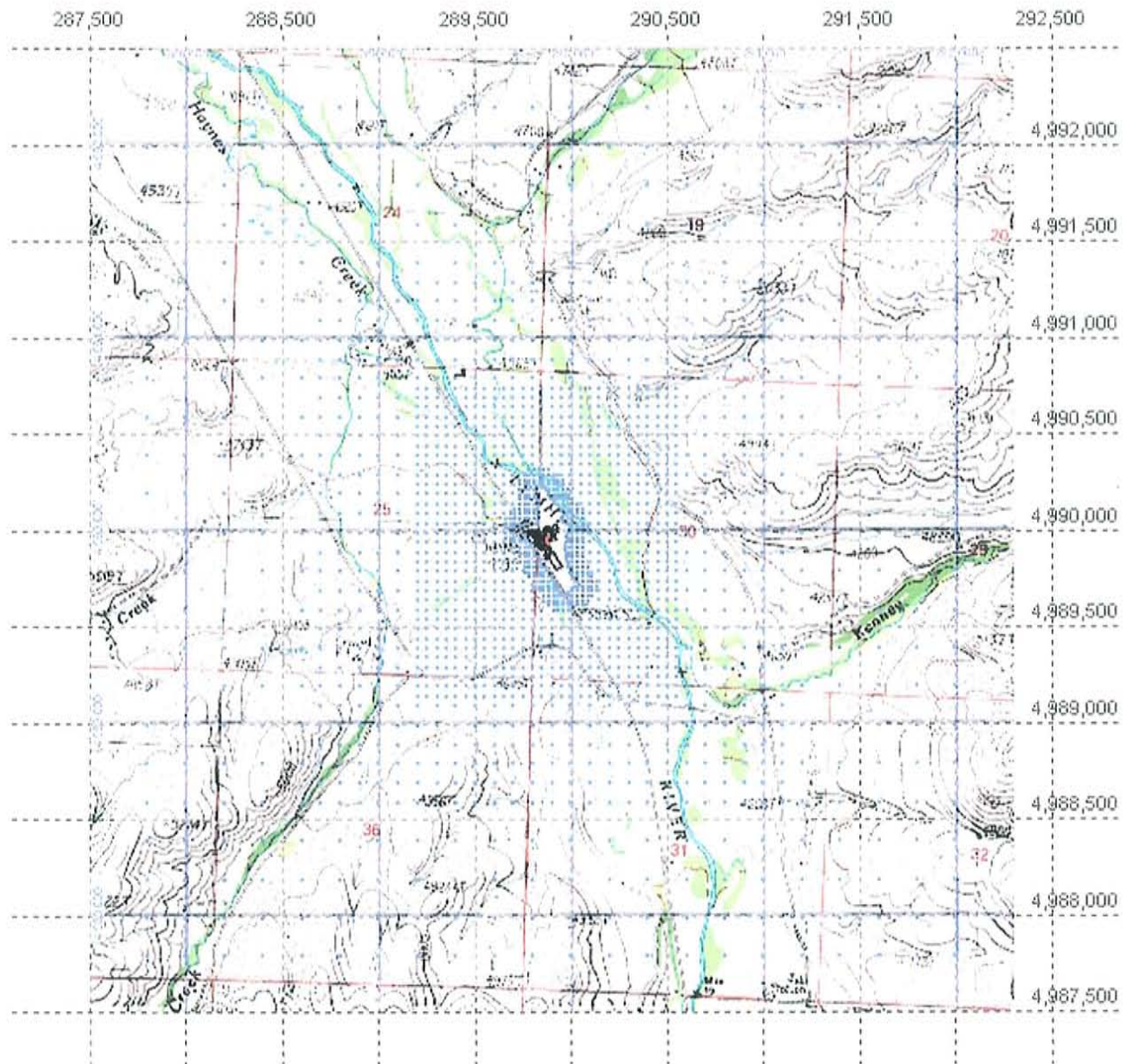
The receptor network is a rectangular grid extending 2,000 meters beyond the fence line. Receptors are spaced from 25 meters apart for the fine grid to 200 meters apart for the coarsest grid as shown in the table and graphic below.

Receptor Spacing

25 meters
50 meters
100 meters
200 meters

Distance

Fence line and out to 100 meters
Out to 500 meters
Out to 1,000 meters
Out to 1,800 meters



5. Elevation Data

The air dispersion modeling analysis will be run considering both simple and complex terrain. DEM data from twenty 7½-minute quadrangles will be used to calculate elevations for the sources, structures and receptors. The DEM file will be included in the air dispersion modeling report. The Quadrangles and terrain limits of the DEM file are illustrated below.



6. Meteorological Data

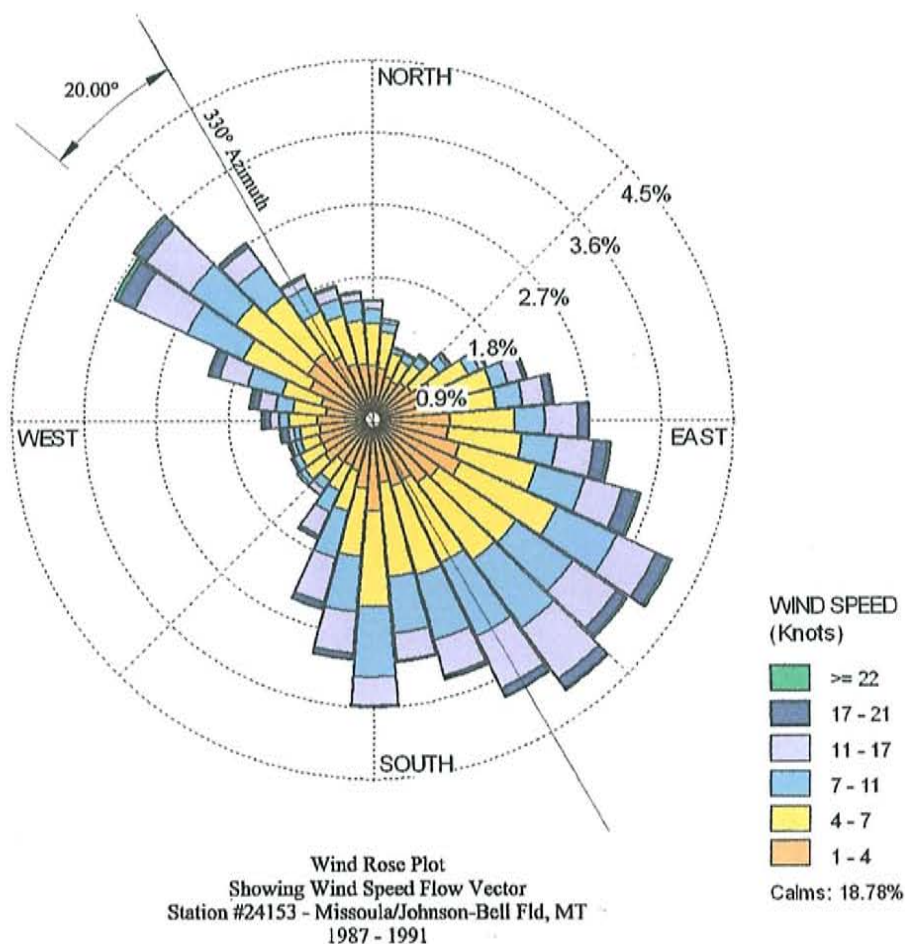
Five years of surface meteorological data from the Missoula, Montana National Weather Station #24153 and upper air meteorological data from the Boise, Idaho National Weather Station #24131 for the years 1987 through 1991 will be used in the air dispersion modeling analysis.

The albedo, Bowen ratio and surface roughness parameters required in the AERMET processing will use the seasonal values shown in the AERMET Manual tables 4-1, 4-2 and 4-3. Four sectors were used to define the surface characteristics within a 3-kilometer radius of the Missoula, Montana meteorological station. The percent grassland and urban land use was estimated for each sector and averaged to define the surface parameters. As suggested by Kevin Schilling, a surface roughness of 0.5 meters was used for surface roughness in urban land use areas. The table below shows the parameters used in the AERMET processing. An image of the Missoula, Montana meteorological station showing the sectors and land use is also included.

AERMET Surface Meteorological Parameters					
Sector	% Urban / % Grassland	Season	Albedo	Bowen	Surface Roughness
1 305°- 350°	12% / 88%	Winter	0.570	1.500	0.061
2 350°- 60°	5% / 95%	Winter	0.588	1.500	0.026
3 60°- 130°	15% / 85%	Winter	0.563	1.500	0.076
4 130°- 305°	0% / 100%	Winter	0.600	1.500	0.001
1 305°- 350°	12% / 88%	Spring	0.175	0.472	0.104
2 350°- 60°	5% / 95%	Spring	0.178	0.430	0.073
3 60°- 130°	15% / 85%	Spring	0.174	0.490	0.118
4 130°- 305°	0% / 100%	Spring	0.180	0.400	0.050
1 305°- 350°	12% / 88%	Summer	0.178	0.944	0.148
2 350°- 60°	5% / 95%	Summer	0.179	0.860	0.120
3 60°- 130°	15% / 85%	Summer	0.177	0.980	0.160
4 130°- 305°	0% / 100%	Summer	0.180	0.800	0.100
1 305°- 350°	12% / 88%	Autumn	0.198	1.120	0.069
2 350°- 60°	5% / 95%	Autumn	0.199	1.050	0.035
3 60°- 130°	15% / 85%	Autumn	0.197	1.150	0.084
4 130°- 305°	0% / 100%	Autumn	0.200	1.000	0.010

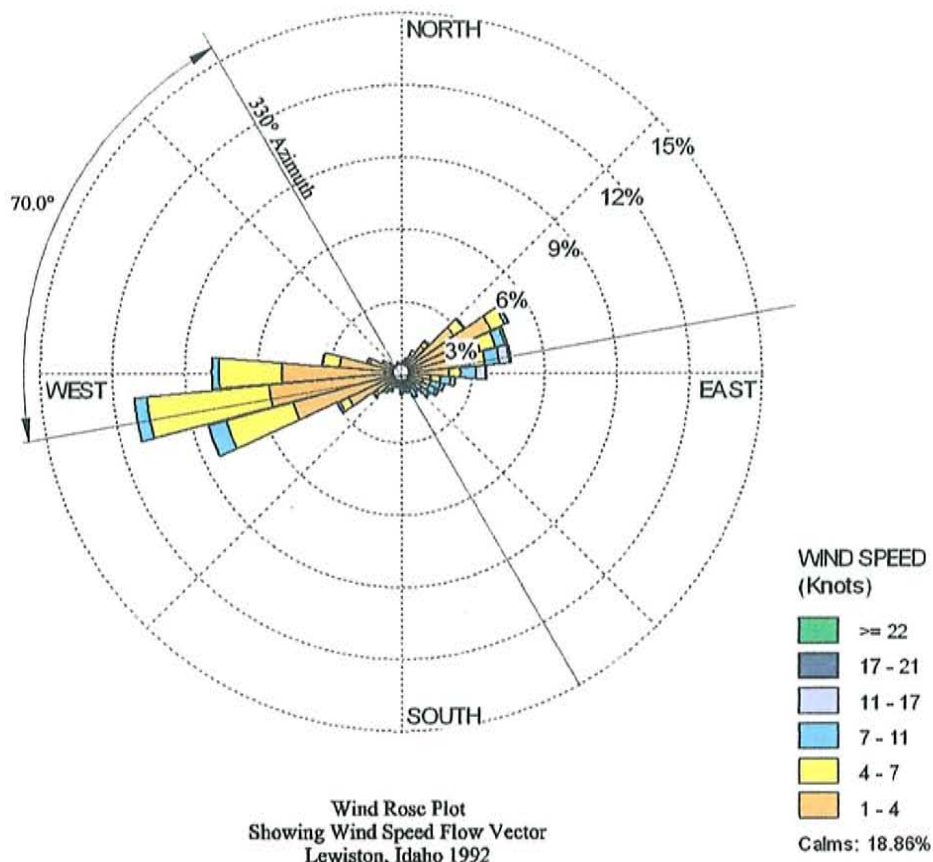


The valley in which QB Corporation is located trends at an azimuth of $330^{\circ}/150^{\circ}$. The Missoula airport trends at an azimuth of $310^{\circ}/130^{\circ}$ which is also the trend of the wind rose vector plot shown below. To correct for the alignment difference, the ROTAN option was used to rotate the wind flow vectors 20 degrees clockwise by subtracting -20° from each wind flow vector.



In response to the modeling protocol, the Idaho DEQ questioned if the Missoula meteorological data was the most representative for the site and also required meteorological data from Lewiston, Idaho to be included with the air dispersion modeling analysis. The preprocessed SFC and PFL files obtained from the Idaho DEQ were apparently processed from meteorological data was supplied by the Potlatch Corporation in Lewiston, Idaho however, the location shown on the SFC file of 45.0°N latitude and 117.0°W longitude places the site about 10 miles northeast of Halfway, Oregon. A profile base elevation of 725 ft. was assumed in the modeling analysis using the Lewiston, Idaho meteorological data.

The trend of the Lewiston wind rose vector plot shown below is approximately 260° . To correct for the alignment difference, the ROTAN option was used to rotate the wind flow vectors 80 degrees clockwise by subtracting -70° from each wind flow vector.



7. Land Use Classification

The modeling analysis was run using rural land use. Over 50 percent of the area within a 3 kilometer radius is classified as A2, agricultural rural or A4, undeveloped rural. Population density is less than 750 people per square mile.

8. Background Concentrations

Rural agricultural background concentrations provided by the Idaho Department of Environmental Quality will be added to the modeled results for the National Ambient Air Quality Standards (NAAQS) analysis. The background concentrations to be used are shown below.

Pollutant	Averaging Period	Background Concentration
PM10	24-hr	73 $\mu\text{g}/\text{m}^3$
	Annual	26 $\mu\text{g}/\text{m}^3$
CO	1-hr	3,600 $\mu\text{g}/\text{m}^3$
	8-hr	2,300 $\mu\text{g}/\text{m}^3$
NO2	Annual	4.3
SO2	3-hr	34 $\mu\text{g}/\text{m}^3$
	24-hr	26 $\mu\text{g}/\text{m}^3$
	Annual	8 $\mu\text{g}/\text{m}^3$
Pb	Quarterly	0.03 $\mu\text{g}/\text{m}^3$

9. Evaluation of Compliance with Applicable Standards

A significant impact analysis for criteria air pollutants was performed to determine if the maximum impact to the ambient air exceeds the significant contribution levels of IDAPA 58.01.01.006.93. For the criteria pollutants that exceeded the significant contribution level, a full impact analysis of the NAAQS was made with background concentrations added to the modeled ambient concentrations. The NAAQS analysis was made for both the 2nd highest and 6th highest PM-10 results. The tables below show the results of the significant impact analysis and the NAAQS analysis.

Significant Impact Analysis for Criteria Air Pollutants

Averaging Period	Meteorological Station	
	Missoula	Lewiston
Modeled 24-hr 1 st highest PM-10 Concentration ($\mu\text{g}/\text{m}^3$)	39.37111	96.84428
Modeled Annual PM-10 Concentration ($\mu\text{g}/\text{m}^3$)	9.33998	14.77702
Modeled 1-hr 1 st highest Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	49.84418	57.35406
Modeled 3-hr 1 st highest Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	34.11859	35.66431
Modeled 8-hr 1 st highest Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	22.25975	27.2069
Modeled 24-hr 1 st highest Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	14.60203	22.81944
Annual Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	2.39638	1.74642

Pollutant	Averaging Period	Meteorological Station	Boiler Emission Rate (lb/hr)	Total Impact ($\mu\text{g}/\text{m}^3$)	Significant Contribution Limit ($\mu\text{g}/\text{m}^3$)	NAAQS Analysis Required?
PM-10	24-hour	Missoula 1987-1991	NA	39.37111	5	YES
	Annual			9.33998	1	YES
Sulfur Dioxide (SO ₂)	3-hour		0.3075	10.49146643	25	NO
	24-hour			4.490124225	5	NO
	Annual			0.73688685	1	NO
Nitrogen Dioxide (NO ₂)	Annual		2.706	6.48460428	1	YES
Carbon Monoxide (CO)	1-hour	Lewiston 1992	7.38	367.8500484	2000	NO
	8-hour			164.276955	500	NO
PM-10	24-hour		NA	96.84428	5	YES
	Annual			14.77702	1	YES
Sulfur Dioxide (SO ₂)	3-hour		0.3075	10.96677533	25	NO
	24-hour			7.0169778	5	YES
	Annual			0.53702415	1	NO
Nitrogen Dioxide (NO ₂)	Annual		2.706	4.72581252	1	YES
Carbon Monoxide (CO)	1-hour		7.38	423.2729628	2000	NO
	8-hour			200.786922	500	NO

Full Impact NAAQS Analysis for Criteria Air Pollutants

Averaging Period	Meteorological Station	
	Missoula	Lewiston
Modeled 1-hr Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	49.84418	57.35406
Modeled 24-hr 2 nd highest Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	11.51089	16.72882
Modeled 24-hr 2 nd highest PM-10 Concentration ($\mu\text{g}/\text{m}^3$)	38.3392	77.88816
Modeled 24-hr 6 th highest PM-10 Concentration ($\mu\text{g}/\text{m}^3$)	32.80528	54.41753
Modeled Annual PM-10 Concentration ($\mu\text{g}/\text{m}^3$)	9.33998	14.77702
Quarterly Concentration at 0.225 Persistence Factor ($\mu\text{g}/\text{m}^3$)	11.21494	12.90466
Modeled Annual Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	2.39638	1.74642

Pollutant	Averaging Period	Rank	Meteorological Station	Boiler Emission Rate (lb/hr)	Total Impact ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Total Ambient Impact ($\mu\text{g}/\text{m}^3$)	Regulatory Limit ($\mu\text{g}/\text{m}^3$)	Percent of NAAQS
PM-10	24-hour	2 nd	Missoula 1987-1991		38.3392	73.0	111.3	150.0	74.23
		6 th			32.8053		105.8		70.54
	Annual	1 st			9.33998	26.0	35.3	50.0	70.68
Nitrogen Dioxide (NO ₂)	Annual	1 st		2.706	6.4846	4.3	10.8	100.0	10.78
Lead	Quarterly			5.904E-04	0.0066	0.0300	0.0366	1.5000	2.44
PM-10	24-hour	2 nd	Lewiston 1992		77.88816	73.0	150.9	150.0	100.59
		6 th			54.41753		127.4		84.95
	Annual	1 st			14.77702	26.0	40.8	50.0	81.55
Sulfur Dioxide (SO ₂)	24-hour	2 nd		0.3075	5.14411215	26.0	31.1	365.0	8.53
Nitrogen Dioxide (NO ₂)	Annual	1 st		2.706	4.7258	4.3	9.0	100.0	9.03
Lead	Quarterly			5.904E-04	0.0076	0.0300	0.0376	1.5000	2.51

The ambient air assessment for the toxic air pollutants that exceeded the emission screening level (EL) is shown below.

Averaging Period	Meteorological Station	
	Missoula	Lewiston
Modeled 24-hr Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	14.60203	22.81944
Modeled Annual Concentration at 1 lb/hr ($\mu\text{g}/\text{m}^3$)	2.39638	1.74642

	Averaging Period	Meteorological Station	Boiler Emission Rate (lb/hr)	Concentration (µg/m³)	Limit (µg/m³)	Percent of Limit
Toxic Air Pollutants						
Acrolein*	24-hour	Missoula	NA	0.72405	12.5	5.79%
Hydrogen Chloride			2.337E-01	3.412	375	0.91%
Silver			2.091E-02	3.05E-01	5	6.11%
Acetaldehyde*	NA		1.84E-01	4.50E-01	40.93%	
Arsenic	7.51E-05		1.80E-04	2.30E-04	78.24%	
Benzene	2.67E-02		6.40E-02	1.20E-01	53.37%	
Benzo(a)pyrene	1.65E-05		3.96E-05	3.00E-04	13.22%	
Cadmium	2.61E-05		6.25E-05	5.60E-04	11.16%	
Carbon Tetrachloride	2.86E-04		6.86E-04	6.70E-02	1.02%	
Chloroform	1.78E-04		4.27E-04	4.30E-02	0.99%	
Chromium, Hexavalent	2.23E-05		5.34E-05	8.30E-05	64.31%	
1,2-Dichloroethane	1.85E-04		4.42E-04	3.80E-02	1.16%	
Formaldehyde*	NA		6.92E-02	7.70E-02	89.91%	
Nickel	2.10E-04		5.03E-04	4.20E-03	11.98%	
Polyaromatic Hydrocarbons	1.87E-05		4.48E-05	3.00E-04	14.92%	
Acrolein*	24-hour	Lewiston	NA	1.1312	12.50	9.05%
Hydrogen Chloride			2.337E-01	5.333	375	1.42%
Silver			2.091E-02	4.77E-01	5	9.54%
Acetaldehyde*	NA		3.06E-01	4.50E-01	68.05%	
Arsenic	7.51E-05		1.31E-04	2.30E-04	57.02%	
Benzene	2.67E-02		4.67E-02	1.20E-01	38.90%	
Benzo(a)pyrene	1.65E-05		2.89E-05	3.00E-04	9.63%	
Cadmium	2.61E-05		4.56E-05	5.60E-04	8.14%	
Carbon Tetrachloride	2.86E-04		5.00E-04	6.70E-02	0.75%	
Chloroform	1.78E-04		3.11E-04	4.30E-02	0.72%	
Chromium, Hexavalent	2.23E-05		3.89E-05	8.30E-05	46.86%	
1,2-Dichloroethane	1.85E-04		3.22E-04	3.80E-02	0.85%	
Formaldehyde*	NA		5.47E-02	7.70E-02	71.06%	
Nickel	2.10E-04		3.67E-04	4.20E-03	8.73%	
Polyaromatic Hydrocarbons	1.87E-05		3.26E-05	3.00E-04	10.87%	

* Acrolein, Acetaldehyde and Formaldehyde modeled at actual emission rates for both the boiler and lumber drying kiln.

Other toxic air pollutants emitted by the boiler only and modeled at a 1 lb/hr emission rate.

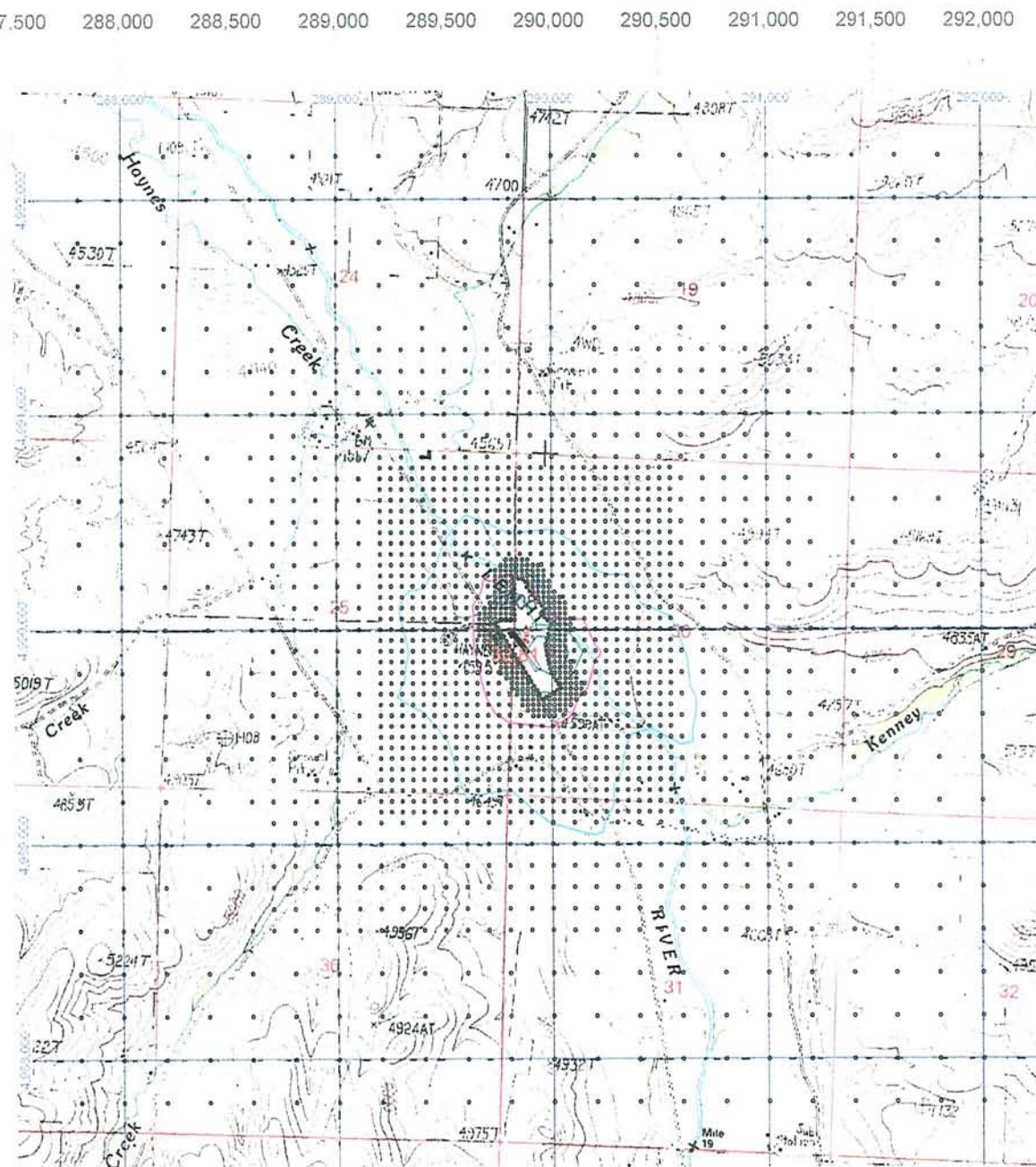
10. Conclusions

Results of the PM-10 ambient impact analysis shows compliance with the NAAQS standard at the more ridged 2nd highest impact using the Missoula meteorological data but not with the Lewiston meteorological data. Both sets of meteorological data show compliance at the 6th highest PM-10 impact. The facility is surrounded by farmland with no residences within the area of significant impact. The PM-10 area of impact using the Missoula and Lewiston meteorological data is shown on the following pages.

Modeling input and output files including the BPIP-Prime input, DEM data and meteorological data are provided on a CD disk. Printouts of the modeling results are also included.

PM-10 Air Dispersion Modeling Results

Contours
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0

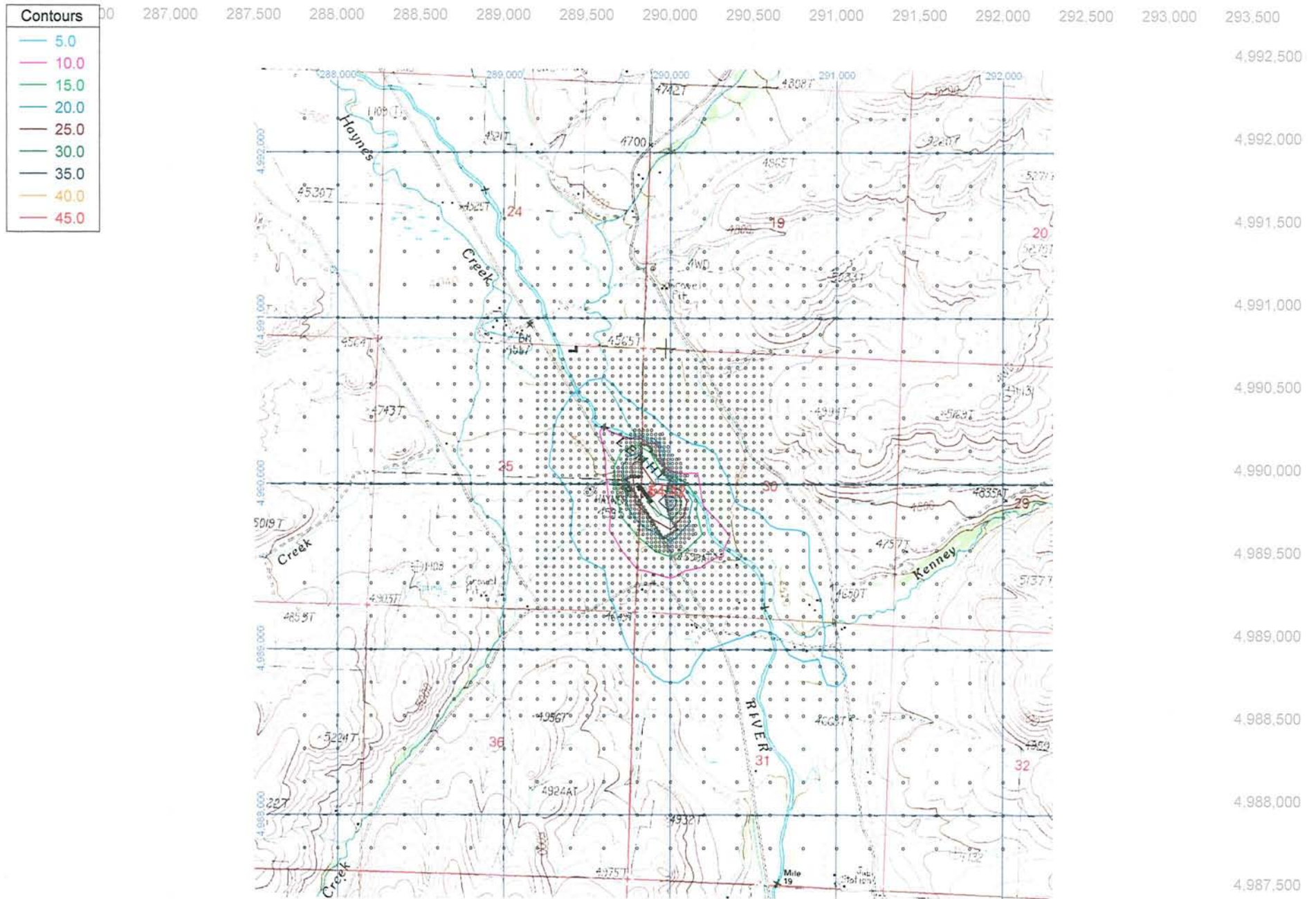


Scale: 1" = 800.0 Meters

HIGH 6TH HIGH 24-HR VALUES FOR GROUP: ALL
Missoula, Montana Meteorological Data

Max = 32.80528 (289834.9, 498

PM-10 Air Dispersion Modeling Results



Scale: 1" = 800.0 Meters

HIGH 6TH HIGH 24-HR VALUES FOR GROUP: ALL
Lewiston, Idaho Meteorological Data

Max = 54.41753 (289984.9, 4989873)